

WE CLAIM:

1. A method of equalization across N (an integer, $N > 1$) channels of a multi-channel link of a communications network, comprising steps of:
 - a) distributing each one of M (an integer, $M > 1$) data signals across the N channels of the link, such that a substantially equal proportion of each data signal is conveyed through each one of the N channels as a composite data-stream; and
 - b) processing the composite data-streams conveyed through the N channels to recover the M data signals;whereby performance variations between the N channels are equalized by averaging within each of the M data signals.
2. A method as claimed in claim 1, wherein each data signal is a Forward Error Correction (FEC) encoded data stream.
3. A method as claimed in claim 1, wherein the step of distributing each one of the M data signals across the N channels of the link comprises steps of:
 - a) dividing each one of the M data signals into N respective sub-streams of substantially equal length; and
 - b) interleaving the sub-streams into respective ones of the N channels.
4. A method as claimed in claim 3, wherein the step of dividing each data signal comprises a step of

inserting a respective predetermined unique identifier into each sub-stream.

5. A method as claimed in claim 3, wherein the step of dividing each data signal comprises, steps of:
 - a) partitioning the data signal into a sequential series of data units having a predetermined length; and
 - b) forwarding each successive data unit, in turn, to a respective sub-stream.
6. A method as claimed in claim 5, wherein each data unit has a length of one or more bits.
7. A method as claimed in claim 5, wherein the step of interleaving one sub-stream of each data signal into a respective one of the N channels comprises using a sequential interleaving process to:
 - a) select a data unit from one sub-stream of each data signal in a predetermined order; and
 - b) forward each selected data unit, in turn, to the channel.
8. A method as claimed in claim 1, wherein the step of processing a composite data-stream conveyed through each of the N channels comprises steps of:
 - a) dividing each composite data-stream to recover respective sub-streams of each data signal; and
 - b) interleaving respective recovered sub-streams of each data signal to recover each one of the M data signals.

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9. A method as claimed in claim 8, wherein the step of dividing each composite data-stream comprises steps of:
- a) partitioning the composite data-stream into a sequential series of data units having a predetermined length; and
 - b) forwarding each successive data unit to a respective one of N recovered sub-streams.
10. A method as claimed in claim 9, wherein each sub-stream within the composite data stream includes a respective predetermined unique identifier, and the step of partitioning the composite data-stream comprises the steps of:
- a) searching the composite data-stream to locate a unique identifier; and
 - b) extracting one or more data units associated with the unique identifier from the composite data stream.
11. A method as claimed in claim 9, wherein each data unit has a length of one or more bits.
12. A method as claimed in claim 9, wherein the step of interleaving respective recovered sub-signals of each data signal to recover each one of the M data signals comprises using a sequential interleaving process to:
- a) select one data unit from each sub-signal of the data signal; and
 - b) append successively selected data units to recover the original data signal.

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13. A method of conveying M (an integer, $M>1$) data signals across a multi-channel link of a communications network, the method comprising steps of:
 - a) at a transmitting end of the link, distributing each one of the M data signals across the N channels of the link, such that a substantially equal proportion of each data signal is conveyed through each one of the N channels as a composite data-stream; and
 - b) at a receiving end of the link, processing respective composite data-streams conveyed through the N channels to recover the M data signals.
14. A method as claimed in claim 13, wherein each data signal is a Forward Error Correction (FEC) encoded data stream.
15. A method as claimed in claim 13, wherein the step of distributing each one of the M data signals across the N channels of the link comprises steps of:
 - a) dividing each one of the M data signals into N respective sub-streams of substantially equal lengths; and
 - b) interleaving one sub-stream of each data signal into a respective one of the N channels.
16. A method as claimed in claim 15, wherein the step of dividing each data signal comprises a step of inserting a respective predetermined unique identifier into each sub-stream.

17. A method as claimed in claim 15, wherein the step of dividing each data signal comprises, for each data signal, the steps of:
 - a) partitioning the data signal into a sequential series of data units having a predetermined length; and
 - b) forwarding each successive data unit, in turn, to a respective one of the N channels.
18. A method as claimed in claim 17, wherein each data unit has a size of one or more bits.
19. A method as claimed in claim 17, wherein the step of interleaving one sub-signal of each data signal into a respective one of the N channels comprises using a sequential interleaving process to:
 - a) select a data unit from one sub-signal of each data signal; and
 - b) forward each selected data unit, in turn, to the channel.
20. A method as claimed in claim 13, wherein the step of processing a composite data-stream received over each of the N channels comprises steps of:
 - a) dividing each composite data-stream to recover respective sub-streams of each data signal; and
 - b) interleaving respective recovered sub-streams of each data signal to recover each one of the M data signals.

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25. A system for of optical equalization across N (an integer, $N > 1$) channels of a multi-channel link of a communications network, the system comprising:
- a) means for distributing each one of M (an integer, $M > 1$) parallel data signals across the N channels of the link, such that a substantially equal proportion of each data signal is conveyed through each one of the N channels as a composite data-stream; and
 - b) means for processing respective composite data-streams conveyed through the N channels to recover the M data signals;
- whereby performance variations between the N channels are optically equalized by averaging within each of the M data signals.
26. A system as claimed in claim 25, wherein each data signal is a Forward Error Correction (FEC) encoded data stream.
27. A system as claimed in claim 25, wherein the means for distributing each one of the M data signals across the N channels of the link comprises:
- a) means for dividing each one of the M data signals into N respective sub-signals of substantially equal length; and
 - b) means for interleaving sub-signals into respective ones of the N channels.
28. A system as claimed in claim 27, wherein the means for dividing each data signal comprises means for

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inserting a respective predetermined unique identifier into each sub-stream.

29. A system as claimed in claim 27, wherein the means for dividing each data signal into sub-streams comprises:
- a) means for partitioning the data signal into a sequential series of data units having a predetermined length; and
 - b) means for forwarding each successive data unit, in turn, to a respective one of the N channels.
30. A system as claimed in claim 29, wherein each data unit has a length of one or more bits.
31. A system as claimed in claim 29, wherein the means for interleaving one sub-stream of each data signal into a respective one of the N channels comprises, for each channel, a sequential interleaving multiplexor adapted to:
- a) select a data unit from one sub-signal of each data signal; and
 - b) forward each selected data unit, in turn, to the channel.
32. A system as claimed in claim 25, wherein the means for processing a respective composite data-stream received over each of the N channels comprises:
- a) means for dividing each composite data-stream to recover respective sub-streams of each data signal; and

b) means for interleaving respective recovered sub-signals of each data signal to recover each one of the M data signals.

33. A system as claimed in claim 32, wherein the means for dividing each composite data-stream comprises:

- a) means for partitioning the bit-stream into a sequential series of data units having a predetermined size; and
- b) means for forwarding each successive data unit to a respective one of N recovered sub-streams.

34. A system as claimed in claim 33, wherein each sub-stream within the composite data stream includes a respective predetermined unique identifier, and the means for partitioning the composite data-stream comprises:

- a) means for searching the composite data-stream to locate a unique identifier; and
- b) means for extracting one or more data units associated with the unique identifier from the composite data stream.

35. A system as claimed in claim 33, wherein each data unit has a size of one or more bits.

36. A system as claimed in claim 33, wherein the means for interleaving respective recovered sub-signals of each data signal to recover each one of the M data signals comprises, for each data signal, a respective sequential interleaving multiplexor adapted to:

- a) select one data unit from each sub-stream of the data signal; and
 - b) append successively selected data units in a predetermined order to recover the original data signal.
37. An apparatus for enabling optical equalization across N (an integer, $N > 1$) channels of a multi-channel link of a communications network, the apparatus comprising means for distributing each of M (an integer, $M > 1$) parallel data signals across the N channels of the link, such that a substantially equal portion of each data signal is conveyed through each one of the N channels.
38. An apparatus as claimed in claim 37, wherein each data signal is a Forward Error Correction (FEC) encoded data stream.
39. An apparatus as claimed in claim 37, wherein the means for distributing each of the M data signals across the N channels of the link comprises:
- a) means for dividing each one of the M data signals into N respective sub-streams of substantially equal length; and
 - b) means for interleaving the sub-streams into respective ones of the N channels.
40. An apparatus as claimed in claim 39, wherein the means for dividing each data signal comprises means for inserting a respective predetermined unique identifier into each sub-stream.

41. An apparatus as claimed in claim 39, wherein the means for dividing each data signal into sub-streams comprises:
- a) means for partitioning the data signal into a sequential series of data units having a predetermined length; and
 - b) means for forwarding each successive data unit, in turn, to a respective one of the N channels.
42. An apparatus as claimed in claim 41, wherein each data unit has a length of one or more bits.
43. An apparatus as claimed in claim 41, wherein the means for interleaving one sub-stream of each data signal into a respective one of the N channels comprises, for each one of the N channels, a sequential interleaving multiplexor adapted to:
- a) select a data unit from one sub-signal of each data signal; and
 - b) forward each selected data unit, in turn, to the channel.
44. An apparatus for enabling optical equalization across N (an integer, $N > 1$) channels of a multi-channel link of a communications network, in which a substantially equal portion of each one of M (an integer, $M > 1$) data signal is conveyed through each one of the N channels, the apparatus comprising means for processing respective composite data-streams received over the N channels to recover the M parallel data signals.

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48. An apparatus as claimed in claim 46, wherein each data unit has a size of one or more bits.
49. An apparatus as claimed in claim 46, wherein the means for interleaving respective recovered sub-signals of each data signal to recover each one of the M data signals comprises, for each one of the M data signals, a respective sequential interleaving multiplexor adapted to:
- a) sequentially select one data unit from each sub-stream of the data signal; and
 - b) append successively selected data units in a predetermined order to recover the original data signal.

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